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User's Guide

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DP2010X 0-5 VDC Analog Output
DP2020X 0-10 VDC Analog Output
DP2030X 0-1mA (Internally Driven) Analog Output
DP2040X 4-20mA (Internally Driven) Analog Output
Process Monitor Options



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The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.



This device is marked with the international hazard symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

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Unpacking

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in event reshipment if necessary.

1.0 BA01, VOLTAGE & CURRENT ANALOG OUTPUTS

The BA01 is an optional analog output board which plugs into J5 of the OMEGAROMETER DP2000 main board. The main assembly is designated by the DP2 prefix in the model number. The third digit in the model number identifies a specific analog output board configuration.

The standard analog output is unaffected by the installation of this option. The optional analog outputs are:

- 0-5 V dc at 2 mA maximum (DP2X1XX)
- 0-10 V dc at 2 mA maximum (DP2X2XX)
- 0-1 mA dc, internally driven (DP2X3XX)
- 4-20 mA, internally driven, with 12 V dc compliance (DP2X4XX)

The outputs are brought out through the rear edge connector, J1. Refer to the signal conditioner section of the main assembly operator's manual for signal input information.

2.0 SPECIFICATIONS

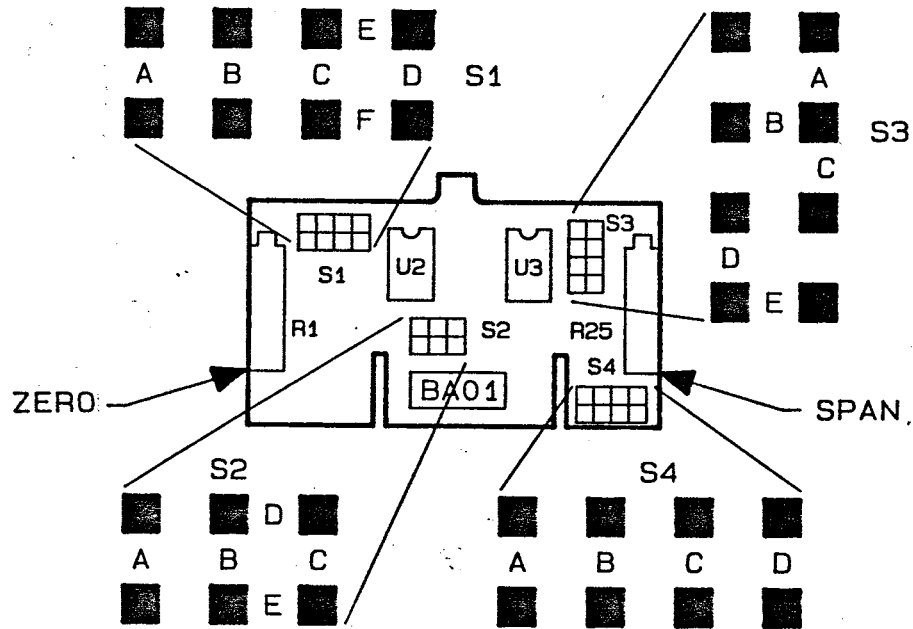
Power and Signals	Supplied by basic meter via internal board connector
Output Control	
Analog Voltage Range	0-10 V
Analog Current Ranges	0-1, 4-20 mA
Offset Ranges	-2.1/-0.9 V -1.1/+0.1 V -0.1/+1.1 V +0.9/+2.1 V
Preamp Gain Ranges	0.471/0.979 0.887/1.843 1.676/3.483 3.123/6.487 5.832/12.12 10.89/22.63
Postamp Gain Ranges	
Voltage	2.51
Current	0.2
Span Tempco	0.0075%/°C
Zero Tempco	325 nA or 100 μ V/°C

3.0 ANALOG OUTPUT CONNECTIONS

Analog output option connections are accessed at the 36-pin main assembly connector, J1. Connections are analog return (ground) at pin T/16 and analog output at pin U.

4.0 CONFIGURATION

The OMEGAROMETER analog output option can be configured using the push-on jumpers provided or already positioned on the board. From the voltage or current output sections, select a standard or special range and install the jumpers as indicated. Remove all jumpers not used.



Analog Output Board
Jumper Locations / Zero and Span Adjustments

4.1 VOLTAGE OUTPUT

STANDARD Voltage Output Ranges (V01 - V04):

Voltage Output Configuration		S1	S2	S3	S4
V01	0-5 V, 40 ohms output impedance	A E F	A B C	B	B
V02	0-5 V, direct from amplifier	A E F	A B C	B	A
V03	0-10 V, 40 ohms output impedance	A E F	A B C	C	B
V04	0-10 V, direct from amplifier	A E F	A B C	C	A

V01 and V03 provide a series 40 ohms resistor to decouple the amplifier output and reduce the possibility of oscillation from improper loading or termination effects. These are standard ranges and meet most application needs.

V02 and V04 provide direct competition to the output of amplifier where 10 ohms output impedance is necessary.

SPECIAL Voltage Output Ranges (VR1 - VR6):

- Calculate the zero offset (with polarity) using the output range and the desired display readings. When specifying upper and lower outputs, the maximum display reading you can have is ± 1999 . Maximum span between upper and lower display is 4000.

LO Lower Output = _____
 UO Upper Output = _____ (10 V, max)
 LD Lower Display = _____
 UD Upper Display = _____

$$ZON = \frac{(LD \times UO) - (UD \times LO)}{(UO - LO)} = \underline{\hspace{2cm}}$$

- Using the ZON calculated, select the range in which the zero offset number falls between the minimum and maximum numbers.

Range	Zero Offset	S1
Z01	-2100 to -900	B E F
Z02	-1100 to +100	A E F
Z03	-100 to +1100	A C D
Z04	+900 to +2100	B C D

- Using the same LO, UO, LD and UD numbers, calculate the gain (G) in counts/output.

$$(G) = \frac{(UD - LD) *}{(UO - LO)} = \underline{\hspace{2cm}}$$

* UD-LD must be between 180 and 4000.

- Select the voltage range which contains the gain calculated. If the gain falls outside of the available gain ranges, use a larger or smaller display reading.

Voltage Gain Range	Counts Displayed	S3
VR1	18.0 to 34.8	-
VR2	33.8 to 65.0	E
VR3	63.0 to 122	D
VR4	117 to 226	C
VR5	222 to 426	B
VR6	416 to 800	A

Analog Voltage Output Configuration		S2	S4
AV01	With 40 ohm in Series	A B C	B
AV02	Without 40 ohm in Series	A B C	A

4.2 CURRENT OUTPUT

Install jumpers as indicated.

STANDARD Current Output Ranges (I01 - I04):

Current Output Configuration		S1	S2	S3	S4
I01	0 to 1 mA Sink	A E F	D E	C	C D
I02	4 to 20 mA Sink	A E F	D E	B	B D
I03	0 to 1 mA Source	A E F	B C	C	C D
I04	4 to 20 mA Source	A E F	B C	B	B D

SPECIAL Current Output Ranges (CR1 - CR12):

1. Calculate the zero offset (with polarity) using the output range and the desired display readings. When specifying upper and lower outputs, the maximum display reading you can have is ± 1999 . Maximum span between upper and lower display is 4000.

LO Lower Output = _____
 UO Upper Output = _____ (1 or 20 mA, max)
 LD Lower Display = _____
 UD Upper Display = _____

$$ZON = \frac{(LD \times UO) - (UD \times LO)}{(UO - LO)} = \underline{\hspace{2cm}}$$

2. Using the ZON calculated, select the zero offset range where the zero offset number falls between the minimum and maximum numbers in that range. Configure as indicated.

Range	Zero Offset	S1
Z01	-2100 to -900	B E F
Z02	-1100 to +100	A E F
Z03	-100 to +1100	A C D
Z04	+900 to +2100	B C D

3. Using the same LO, UO, LD and UD numbers, calculate the gain (G) in counts/output.

$$(G) = \frac{(UD - LD) *}{(UO - LO)} = \underline{\hspace{2cm}}$$

* UD-LD must be between 180 and 4000.

4. Select the current range which contains the gain number calculated. If the gain falls outside of the available gain ranges, use a larger or smaller display reading. Configure as indicated.

20 mA Output Gain Range	Counts Displayed	S3	S4
CR1	9.0 to 17.4	-	B D
CR2	16.9 to 32.5	E	B D
CR3	31.5 to 60.8	D	B D
CR4	58.7 to 113	C	B D
CR5	111 to 213	B	B D
CR6	208 to 400	A	B D

1 mA Output Gain Range	Counts Displayed	S3	S4
CR7	180 to 348	-	C D
CR8	338 to 650	E	C D
CR9	630 to 1216	D	C D
CR10	1174 to 2260	C	C D
CR11	2220 to 4260	B	C D
CR12	4160 to 8000	A	C D

Analog Output		S2
ACO1	Analog Current Out - Sink	D E
ACO2	Analog Current Out - Source	B C

5.0 CALIBRATION

Calibration of the DP2000 assumes that the input signal conditioner has already been calibrated. Calibration procedures are standard or special, previously determined in Section 4.

R1 = Zero R25 = Span

5.1 STANDARD VOLTAGE OUTPUT (V01 - V04)

1. Attach a voltmeter (3 1/2 digit or more with minimum 1 MOhm input impedance) positive lead to J1-pin U and the negative lead to J1-pin T/16 on the rear panel of the unit.
2. Set the voltmeter range greater than or equal to 10 V dc full-scale.
3. With the LO signal input reading zero on the display, adjust R1 to read zero on the external voltmeter.
4. With the HI signal input reading 1900 on the display, adjust R25 to read 4.75 V for the V01 or V02 range and 9.50 V for the V03 or V04 range on the external voltmeter.
5. Repeat steps above as required to set the output reading to within ± 10 mV.

5.2 SPECIAL VOLTAGE OUTPUT (VR1 - VR6)

1. Attach a voltmeter (3 1/2 digit or more with minimum 1 MOhm input impedance) positive lead to J1-pin U and the negative lead to J1-pin T/16 on the rear panel of the unit.
2. Set the voltmeter range greater than or equal to 10 V dc full-scale.
3. Apply an input signal to obtain the lower display (LD) reading and adjust R1 to read the lower output (LO) on the external voltmeter.
4. Apply an input signal to obtain the upper display (UD) reading and adjust R25 to read the upper output (UO) on the external voltmeter.
5. Repeat steps above as required to set the output reading to within ± 10 mV.

5.3 STANDARD CURRENT OUTPUT (I01 - I04)

1. Attach an ammeter (3 1/2 digits or more) positive lead to J1-pin U and the negative lead to J1-pin T/16 on the rear panel of the unit.
2. Set the ammeter range greater than or equal to 20 mA full-scale.

For I01 or I03:

1. With the LO signal input reading zero on the display adjust R1 to read zero on the external ammeter.
2. With the HI signal input reading 1900 on the display adjust R25 to read 0.95 mA on the external ammeter.
3. Repeat steps above as required to set the output reading to within $\pm 10 \mu\text{A}$.

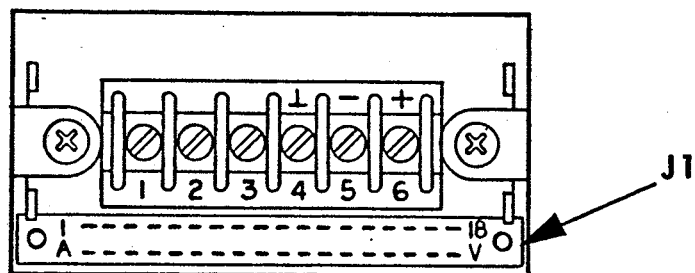
For I02 or I04 (polarity of the output current will be negative):

1. With the LO signal input reading zero on the display, adjust R1 to read zero on the external ammeter.
2. With the HI signal input reading 1900 on the display, adjust R25 to read 15.2 mA on the external ammeter.
3. Repeat steps above as required to set the output reading to within $\pm 80 \mu\text{A}$.
4. With the LO signal input reading zero on the display, adjust R1 to read 4.0 mA on the external ammeter.

5.4 SPECIAL CURRENT OUTPUT (CR1 - CR12)

1. Attach an ammeter (3 1/2 digit or more with minimum 1 MOhm input impedance) positive lead to J1-Pin U and the negative lead to J1-Pin T/16 on the rear panel of the unit.
2. Set the ammeter range greater than or equal to 20 mA full-scale.
3. Apply an input signal to obtain the lower display (LD) reading and adjust R1 to read the lower output (LO) on the external ammeter.
4. Apply an input signal to obtain the upper display (UD) reading and adjust R25 to read the upper output (UO) on the external ammeter.
5. Repeat steps above as required to set the output reading to within $\pm 10 \mu\text{A}$.

6.0 MAIN BOARD CONNECTOR PIN ASSIGNMENTS



REAR VIEW TERMINAL

J1 Connection	Function	
A - 1	Spare	
B	Oscillator	40 kHz
2	-8.2 V dc Analog power	
C - 3	Spare	
D	+ POLARITY	+ Polarity sign
4	HOLD	LED version only
E - 5	Spare	
F	Buffer Integrator output	
6	Digital Ground	
H - 7	199.9 (Decimal point)	Use with pin 6
J - 8	19.99 (Decimal point)	Use with pin 6
K - 9	1.999 (Decimal point)	Use with pin 6
L - 10	Test (LED version only)	Use with pin M/11
M - 11	+5 V dc	Analog & digital power
N - 12	Analog output	Standard 1 mV/count
P - 13	Spare	
R - 14	Spare	With H & S options - Excitation sense
S - 15	Analog Ground	
T - 16	Analog Option - Return	Used with analog option
U	Analog Option - Out	Used with analog option
17	+30 V dc	Unregulated power
V - 18	Spare	Used with S option + Excitation sense

- Indicates common pin.

CAUTION: A maximum total current of 50 mA is available for all signal conditioner excitation outputs, 4-20 mA controller and analog output combinations.

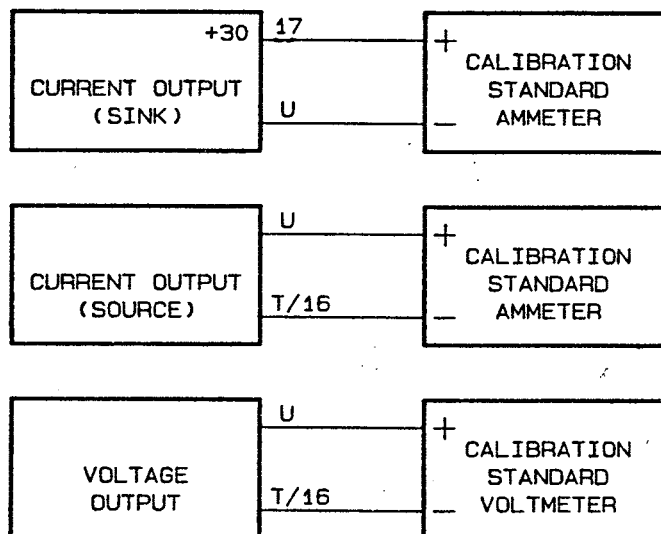
7.0 TESTS & DIAGNOSTICS

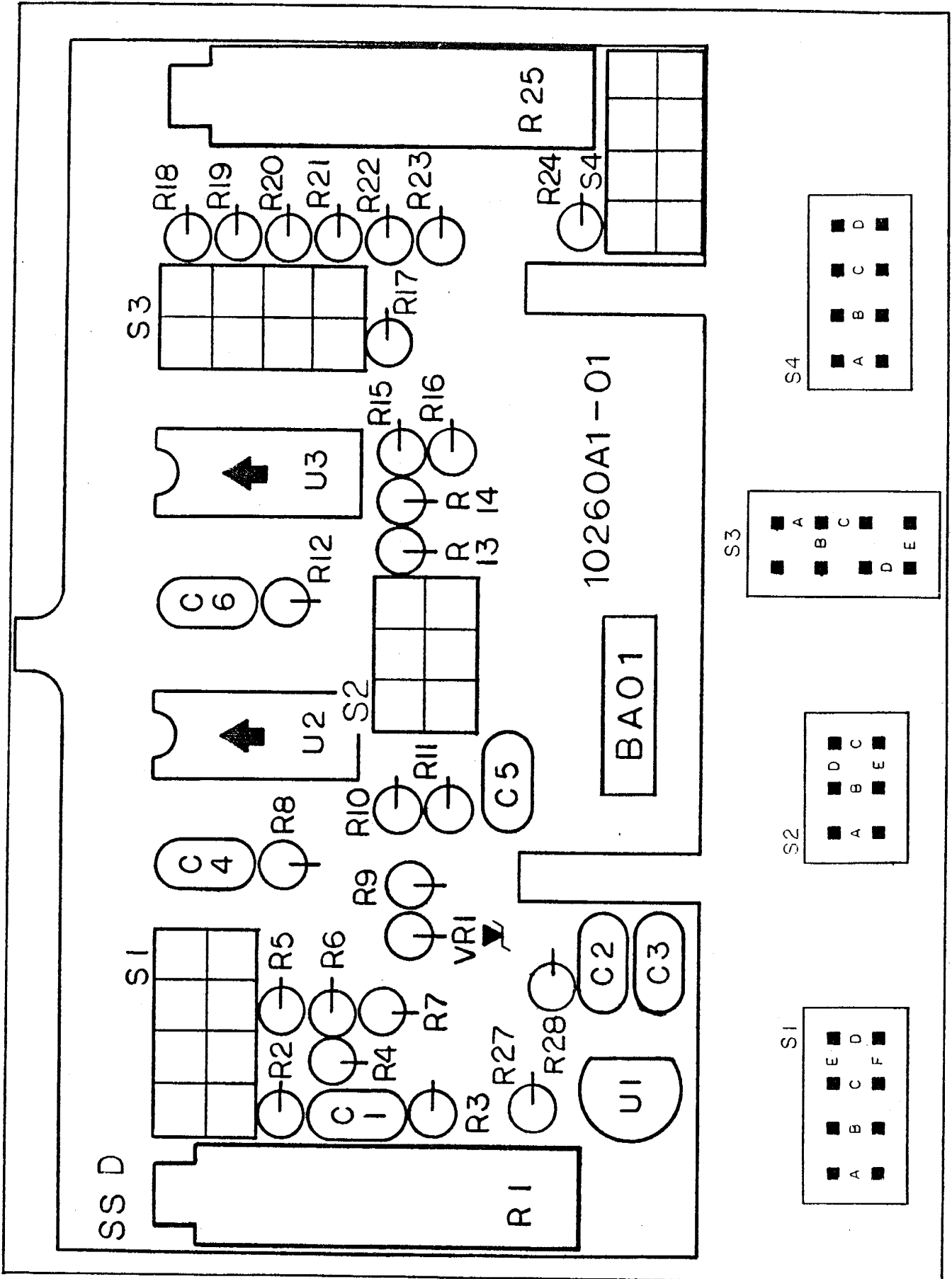
There is no provision for testing the analog output board BA01 alone. The OMEGAROMETER DP2000 is designed to function with a main assembly and a signal conditioner as a minimum configuration.

Refer to the specifications in your main assembly operator's manual for signal input requirements.

7.1 FUNCTIONAL ELECTRICAL TESTING:

1. Perform the test after your signal conditioner has been configured, the entire unit has been assembled and the case is closed.
2. On the barrier strip (TB1), apply known input value to terminals 4, 5 and 6. Apply proper power for your configuration to terminals 1, 2, and 3.
3. Monitor the output for the configured voltage or current output (pins T/16 and U on main assembly connector, J1).





BA01 Assembly Diagram



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

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3. Repair instructions and/or specific problems relative to the product.

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